WHAT IS CLAIMED IS:

1. A system for separating oil and/or oily coated solids from a gaseous oily water mixture comprising:

an upright vessel having an inlet for introducing gaseous oily water mixture into an upper portion of the vessel, a water outlet in a lower portion of the vessel and an oil outlet;

an upright tubular cyclonic inlet member positioned concentrically within an upper portion of said vessel and connected to tangentially receive the gaseous oily water mixture from said vessel inlet and for extracting by cyclonic action, large gas bubbles from the inlet mixture without extracting small gas bubbles therefrom and for discharging the inlet mixture in a substantially horizontal pattern that disperses the oily water mixture over substantially all the full cross-sectional area of said vessel;

an eductor positioned within a lower portion of said vessel having a water inlet connected to a source of pressurized water, a gas inlet connected to a source of gas and an outlet through which water having small gas bubbles entrained therein is ejected, the outlet being arranged to disseminate water in a radial substantially horizontal pattern that disperses the small gas bubbles over substantially all of the full cross-sectional area of said vessel so that the small gas bubbles migrate upwardly to adhere to and add buoyancy to oil and/or oily coated solids; and

an oil skimmer in a top portion of said vessel by which separated oil and/or oily coated solids are collected.

2. A system according to Claim 1 including:

a coalescing section between said vessel inlet and said water outlet by which oil

droplet coalescence is fostered.

3. A system according to Claim 2 in which said coalescing section is provided by a horizontal layer of spaced apart oleophylic elements.

4. A system according to Claim 1 wherein gas extracted by said cyclonic inlet member collects within an upper interior portion of said vessel and including a pipe communicating said eductor to said upper interior portion of said vessel providing said source of gas.

5. A system according to Claim 1 including a water pump having an inlet in communication with said vessel water outlet and an outlet in communication with said eductor inlet providing said source of pressurized water.

6. A system according to Claim 1 wherein said source of pressurized water is a pump having an inlet connected to said vessel water outlet and said source of gas is a pipe connected to an upper interior portion of said vessel whereby said water and said gas employed in said eductor are both recycled from within said vessel interior.

7. A system according to Claim 1 wherein said eductor is in the form of a venturi body having a venturi-forming passageway therethrough connected at one end to said source of pressurized water, the venturi body having a laterally extending gas inlet opening communicating with said venturi-forming passageway and an eductor outlet end surface that receives said venturi-forming passageway; and

a horizontal deflector plate spaced from said eductor outlet end surface providing a horizontal circumferential outlet by which water and small gas bubbles are distributed

radially and horizontally from said eductor into said vessel interior.

8. A system according to Claim 1 wherein a two-stage skim bucket is positioned within said upper portion of said vessel, the skim bucket comprising:

a bottom plate covering a portion of the horizontal cross-sectional interior of said vessel to cause water discharged from the vessel to come uniformly from the entire cross-section of the vessel.

a first vertical wier plate extending upwardly from said bottom plate and forming with a sidewall portion of said vessel an oil collection cavity connected to said vessel oil outlet; and

a second vertical wier plate extending upwardly from said bottom plate and spaced from said first wier plate and forming a slosh dampening area whereby slosh motion of skimmed oil and water are dampened to permit better oil/water separation and skimming without taking excess water out with the oil.

9. A system according to Claim 8 wherein said first vertical wier plate has a downward extension below said bottom plate to prevent gas bubbles from rising up a front face of said skim bucket that would inhibit skimming.

10. A system according to Claim 1 wherein the oily water mixture has a downward plug flow rate having an average vertical velocity of about two feet per minute.

11. A system according to Claim 1 wherein said tubular cyclonic inlet member pre-coalesces oil droplets in the oily water inlet mixture as the mixture is discharged into the interior of said vessel.

12. A system according to Claim 1 wherein said cyclonic inlet member discharges said inlet oily water mixture in a cyclonic motion within said upper portion of said vessel.

13. A system according to Claim 1 wherein water discharged from said eductor has entrained therein gas bubbles in which a substantial portion are of about 100 to 500 microns in initial diameter.

14. A system according to Claim 1 wherein water discharged from said eductor has entrained therein gas bubbles in which a substantial portion are of about 100 to 300 microns in initial diameter.

15. A system according to Claim 1 wherein said eductor introduces gas in the form of bubbles into said oily water mixture at a rate of about 0.3 to 3.0 square cubic feet per barrel of oily water passing into said vessel inlet.

16. A system according to Claim 1 wherein said eductor introduces gas in the form of bubbles into said oily water mixture at a rate of about 0.5 to 1.0 square cubic feet per barrel of oily water passing into said vessel inlet.

17. A method of separating oil and/or oily coated solids from a gaseous oily water mixture in an upright vessel having an inlet for introducing gaseous oily water mixture into an upper portion of the vessel, a water outlet in a lower portion of the vessel and an oil outlet, comprising the steps of:

(a) flowing the gaseous oily water mixture from said vessel inlet tangentially into an upright tubular cyclonic inlet member positioned concentrically within an upper portion of said vessel;

(b) extracting by cyclonic action, large gas bubbles without extracting small gas bubbles and discharging the inlet mixture in a substantially horizontal pattern to disperse the oily water mixture over substantially all the full cross-sectional area of said vessel;

(c) flowing pressurized water through an eductor positioned within a lower portion of said vessel, the eductor having a gas inlet connected to a source of gas and an outlet through which ejected water having small gas bubbles entrained therein passes;

(d) disseminating the ejected water and entrained gas bubbles in a radial substantially horizontal pattern that uniformly disperses the small gas bubbles over substantially the full cross-sectional area of said vessel, the small gas bubbles migrating upwardly to adhere to and add buoyancy to oil and/or oily coated solids;

(e) skimming separated oil and/or oily coated solids in a top portion of said vessel; and

(f) discharging the separated oil and/or oily coated solids through said oil outlet.

18. A method according to Claim 17, including the step of passing the inlet mixture through a coalescing section positioned between said vessel inlet and said water outlet to promote oil droplet coalescence.

19. A method according to Claim 17 in which the step of passing the inlet mixture through a coalescing section includes passing the inlet mixture through a horizontal layer of spaced apart oleophylic elements.

20. A method according to Claim 17 wherein gas extracted by said cyclonic inlet member collects within an upper interior portion of said vessel and including the step of passing

gas by way of a pipe extending from the vessel upper interior portion to said eductor gas inlet thereby providing said source of gas.

21. A method according to Claim 17 including the step of employing a water pump having an inlet in communication with said vessel water outlet and an outlet in communication with said eductor inlet providing said source of pressurized water

22. A method according to Claim 17 including the step of providing pressurized water by means of a pump having an inlet connected to said vessel water outlet and the step of providing a source of gas in the form of a pipe connected to an upper interior portion of said vessel whereby water and gas employed in said eductor are both recycled from within said vessel interior.

23. A method according to Claim 17 including the step of providing an eductor in the form of a venturi body having a venturi-forming passageway there through connected at one end to said source of pressurized water, the venturi body having a laterally extending gas inlet opening communicating with said venturi-forming passageway and an eductor outlet end surface that receives said venturi-forming passageway and including the step of horizontally deflecting water from said eductor outlet by which water and small gas bubbles are distributed radially and horizontally into said vessel interior.

24. A method according to Claim 17 wherein the step of skimming separated oil and/or oily coated solids includes the use of a two-stage skim bucket.

25. A method of separating oil and/or oily coated solids from an oily water mixture in an upright vessel, including the steps of:

(a) introducing the oily water mixture in a horizontal pattern over

substantially the full cross-sectional area of an upper portion of the vessel;

(b) pumping water under pressure through an eductor having a source of gas to provide water having small gas bubbles infused therein;

(c) distributing water having small gas bubbles infused therein from the eductor in a substantially horizontal pattern over substantially the full cross-section area of a lower portion of the vessel, bubbles from the water migrating upwardly and attaching to oil droplets and oily coated solids augmenting the buoyancy thereof, enhancing oil and oily coated solids separation; and

(d) withdrawing oil and oily coated solids from an upper portion and cleaned water from a lower portion of the vessel.

26. A method of separating oil and/or oily coated solids from an oily water mixture according to Claim 25 wherein step (a) includes:

flowing the oily water mixture tangentially into an upright cyclone inlet member positioned concentrically within an upper portion of the vessel whereby any entrained large gas bubbles are extracted from the mixture; and

horizontally deflecting the mixture outlet from the cyclone inlet member in a said horizontal pattern.

27. A method of separating oil and/or oily coated solids from an oily water mixture according to Claim 25 wherein said eductor is positioned in a manner to provide a substantially uniform distribution of small gas bubbles over the entire cross section of the vessel and includes a vertical water discharge outlet and includes the step of horizontally deflecting water from said lower portion of the vessel into a circumferential substantially horizontal pattern as the water enters said water discharge outlet.

28. A method of separating oil and/or oily coated solids from an oily water mixture according to Claim 25 wherein said vessel has a water collecting area in a lower portion therein and including the step of extracting water from said vessel lower portion to provide water as employed in step (b).

29. A method of separating oil and/or oily coated solids from an oily water mixture according to Claim 25 including the step of skimming oil and oily coated solids from an upper portion of the vessel employing a two stage skim bucket.

30. A method of separating oil and/or oily water coated solids from an oily water mixture according to Claim 25 including the steps of passing both the down flowing oily water mixture and the upwardly migrating bubbles through a coalescing section formed by a horizontal layer of oleophylic elements.

31. A method according to Claim 25 wherein the oily water mixture has an average vertically downward flow velocity of about two feet per minute.

32. A method according to Claim 25 wherein the step of discharging the inlet mixture in a substantially horizontal pattern includes discharging the inlet mixture with a cyclonic motion in an upper portion of the vessel.

33. A method according to Claim 25 wherein a substantial portion of said small gas bubbles entrained in the water ejected from said eductor are of about 100 to 500 microns in initial diameter.

34. A method according to Claim 25 in which said eductor introduces gas in the form of bubbles into said oily water mixture at a rate of about 0.3 to 3.0 standard cubic feet of gas per barrel of oily water passing into said vessel.

35. A method according to Claim 25 in which said eductor introduces gas in the form of bubbles into said oily water mixture at a rate of about 0.5 to 1.0 standard cubic feet of gas per barrel of oily water passing into said vessel.